JULY 1972
BRIEFING PAPERS
USE FOR
DOCKETT
IP BOARD
19J PROP

PLANNING ASSUMPTIONS

Increasing size and complexity of processing load because:

Economies sought in Agency activities

New sophisticated projects

Advances in computer technology

Computer back-up needed for production

Economy of scale is valid goal.

PLAN

Largest systems necessary - fewest systems possible

- Network of computers

  ...Two large batch and interactive processors

  ...Two time sharing systems

PROPOSAL

Install 195-1 in Spring 1972

Install 155-1 in Spring 1973

Release 70/45 and 70/35

both 65's or

65-2 and 67-2

by Spring 1973

OCS GOALS

Scientific Applications

- High bandwidth online signal processing
- Modelling and simulation
- Resource allocation techniques (linear/non-linear programming)
- Improved statistical analysis

Intelligence Applications

- Large files (200 M characters. Search on 50 attributes (1, 000/day)
- Small file capability, probably improved GIM
- National resources data base and handling

Management Applications

- SIPS project to fruition -- on time and as advertised
- OMS support
- Develop useable management systems (resource allocation and query)

R&D

- With ORD operate an integrated, jointly managed R&D center

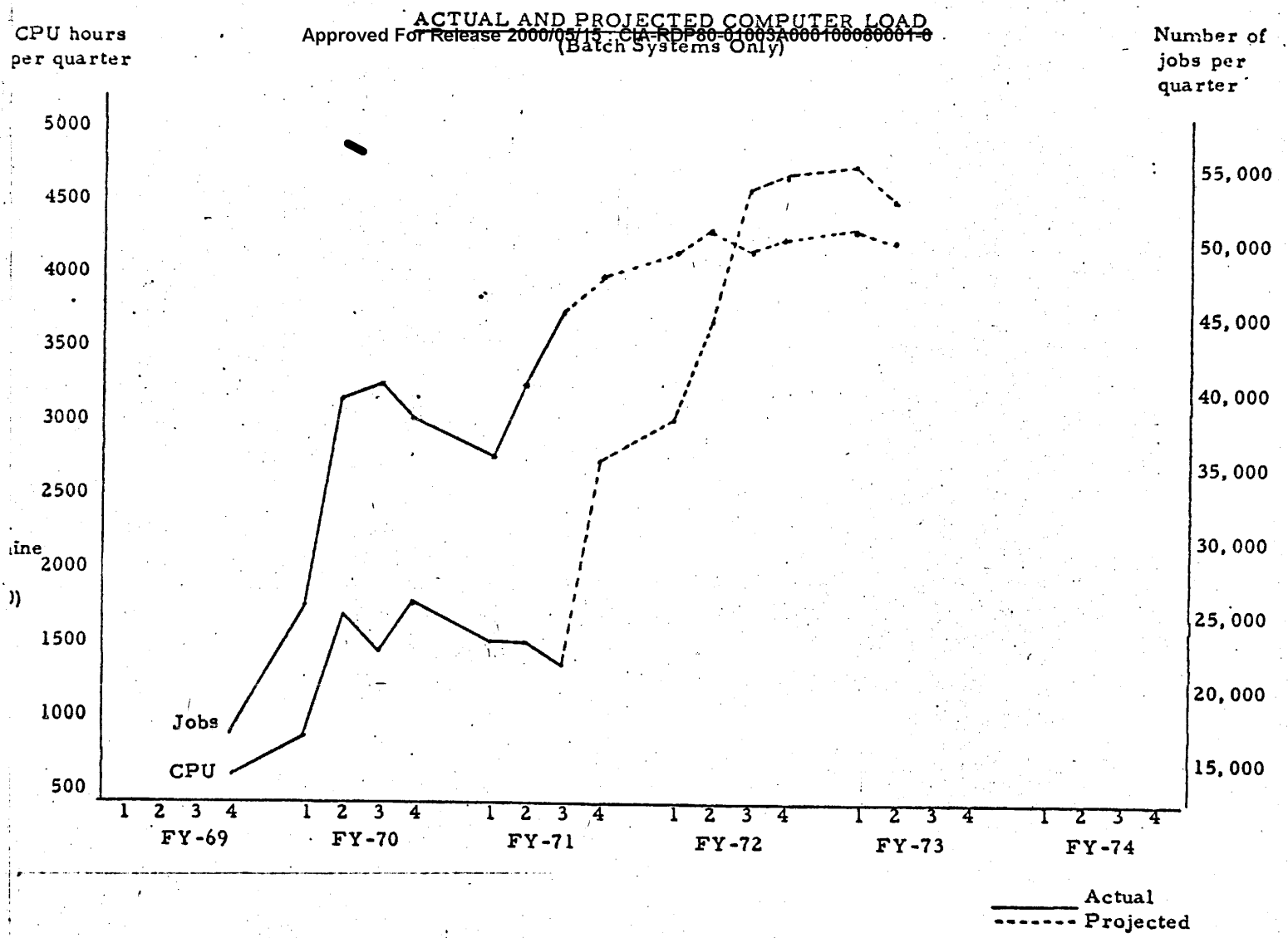
Signal Processing

- With ORD, OEL and perhaps O/C operate an integrated, jointly managed signal processing center.

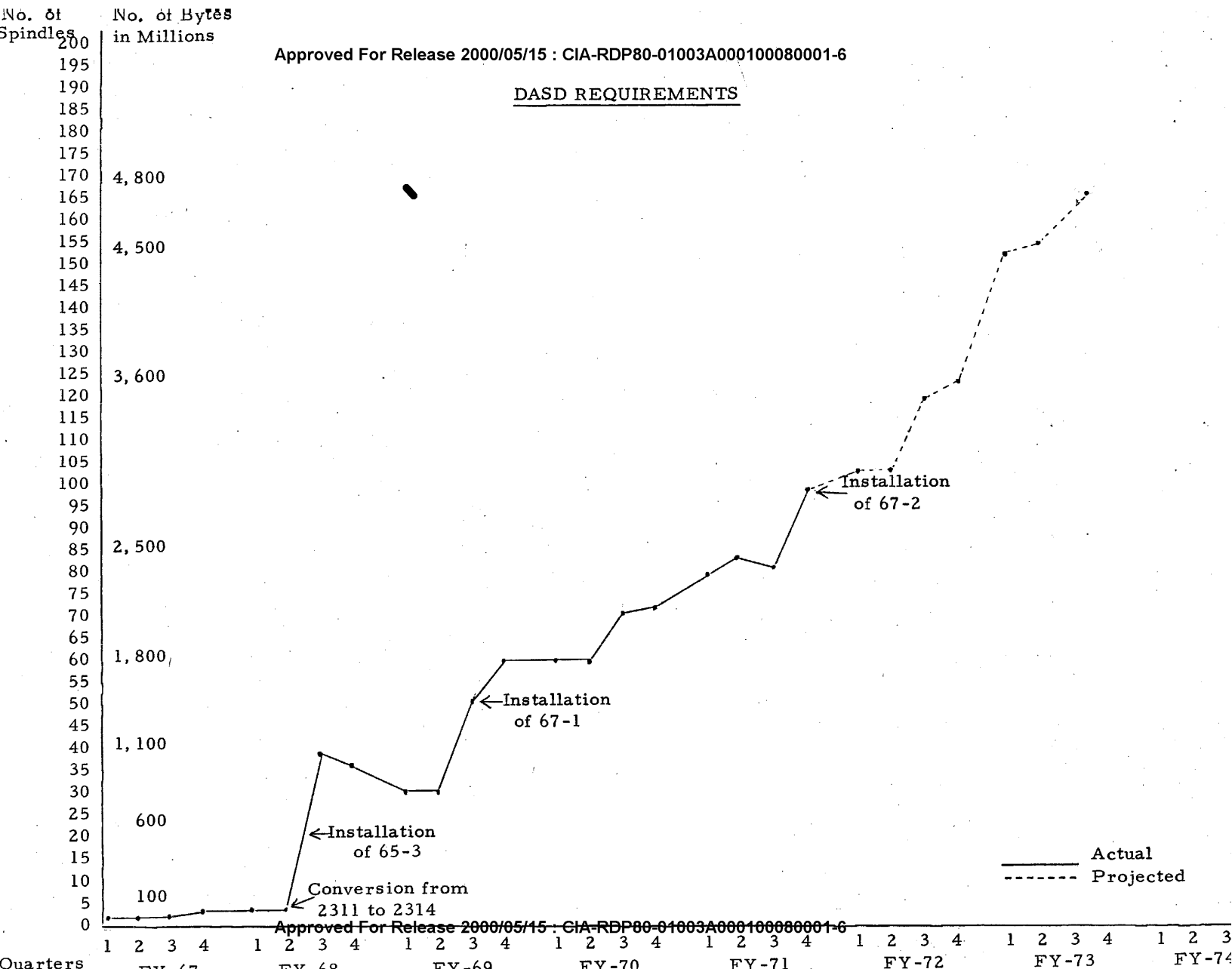
Training

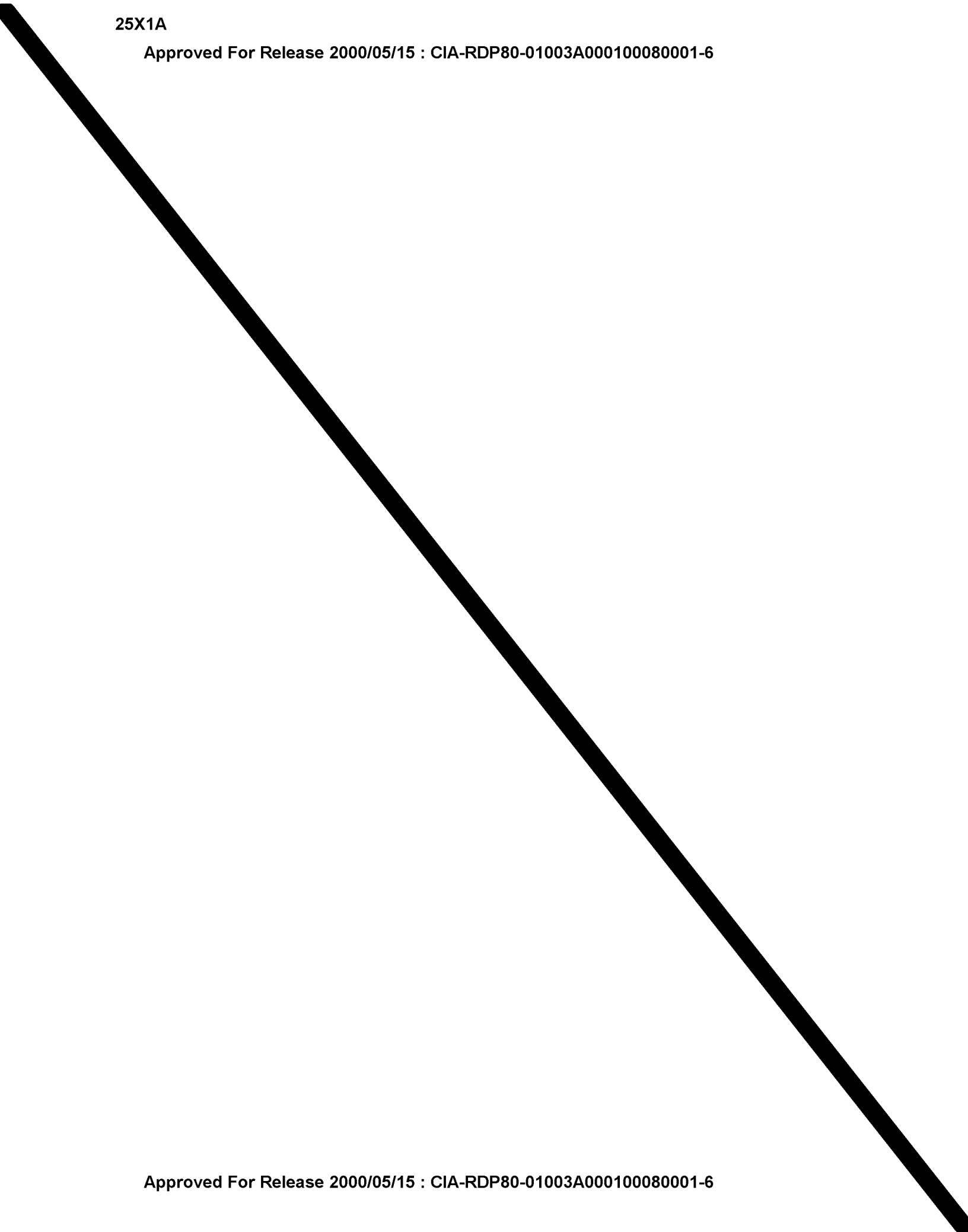
- More sophisticated techniques
- More advanced techniques

ACTUAL AND PROJECTED COMPUTER LOAD
(Batch Systems Only)



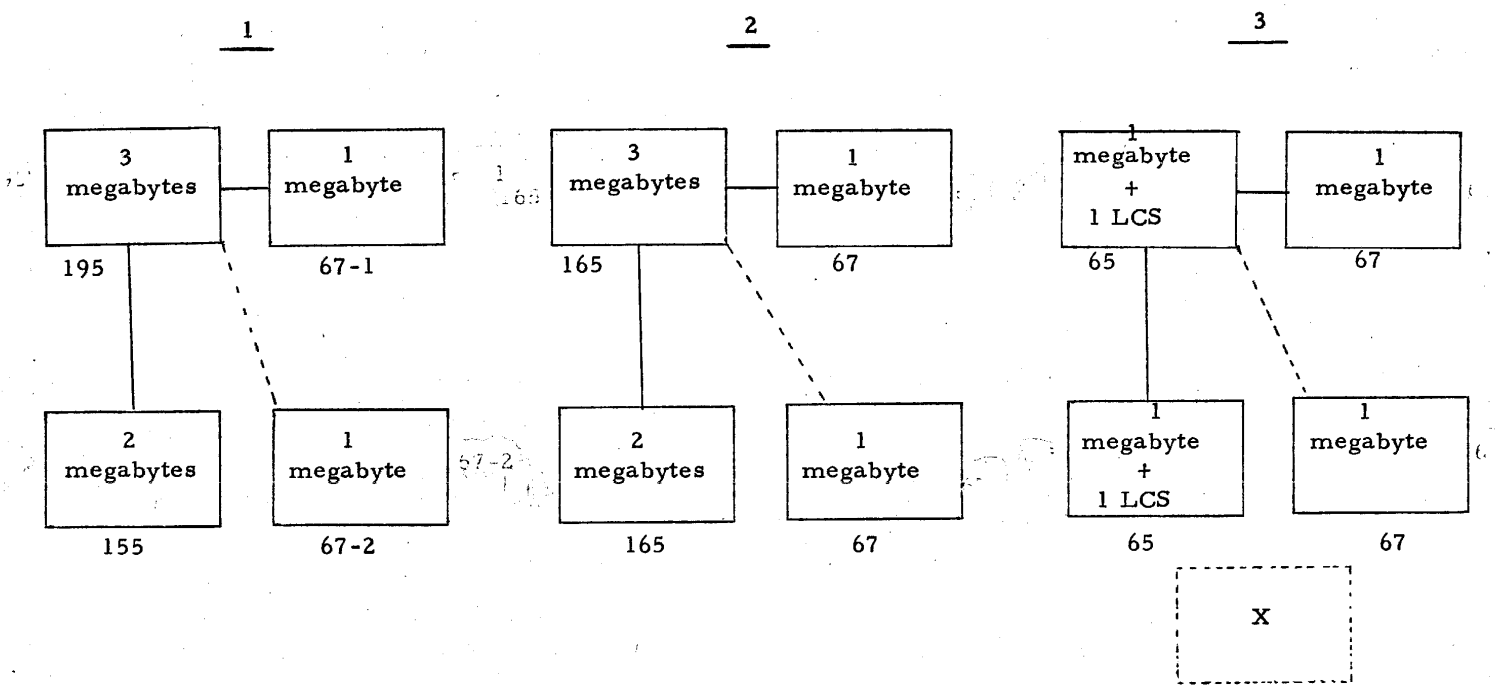
DASD REQUIREMENTS





Approved For Release 2000/05/15 : CIA-RDP80-01003A000100080001-6

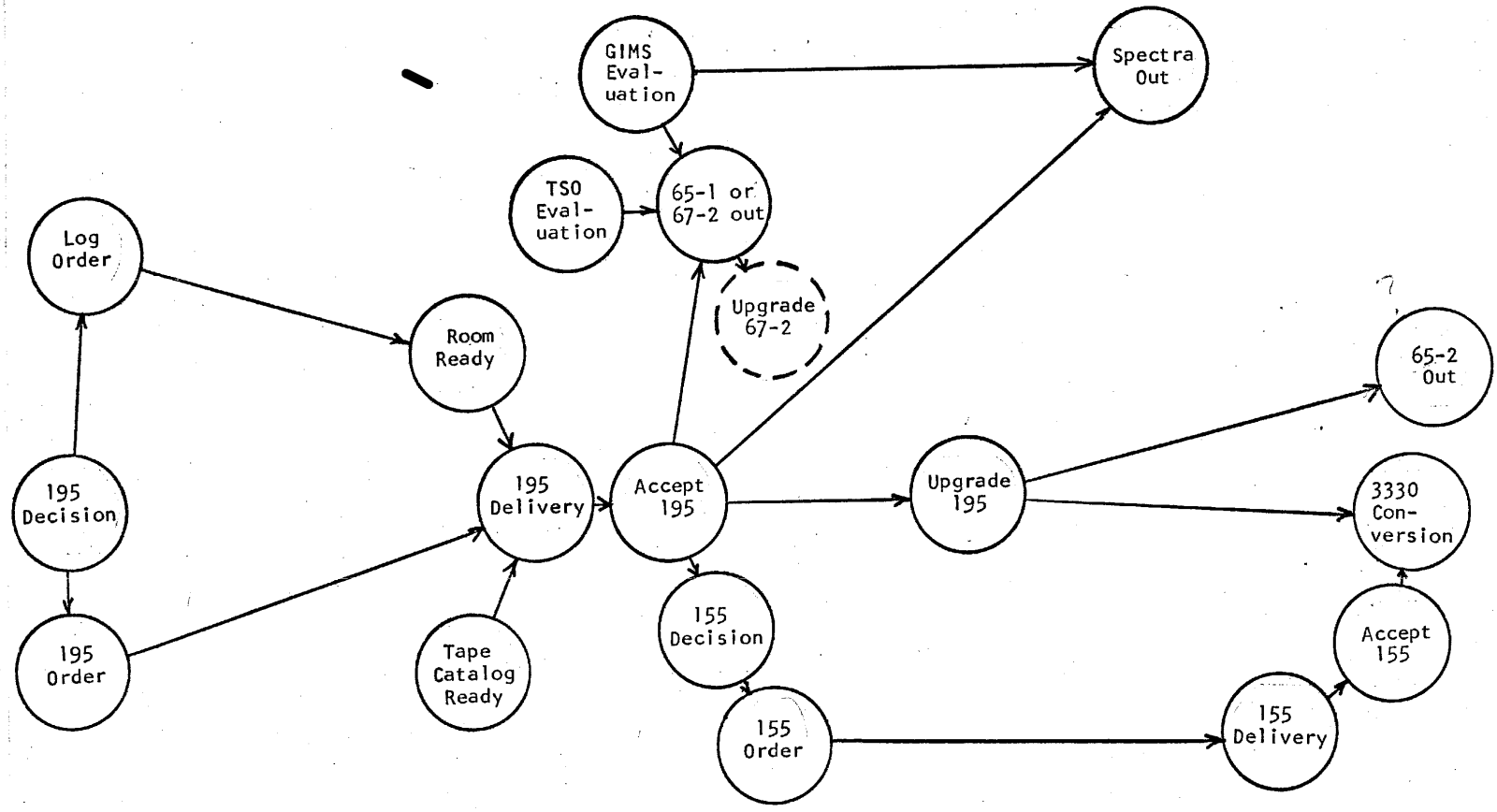
THREE ALTERNATIVE CONFIGURATIONS (Final)



STORAGE AND PERIPHERALS CAPACITY

	1 July 71 (FY-72)			1 July 72 (FY-73)			1 July 73 (FY-74)		
Main Core	3.5	megabytes	$129	4.5	megabytes	$134	6.8	megabytes	$140
Extended Core	1.0	megabytes	7	2.0	megabytes	14	1.0	megabytes	7
Drum	12.2	megabytes	16	39.9	megabytes	26	61.9	megabytes	37
Disk	2,523.0	megabytes	49	6,066.0	megabytes	101	7,168.0	megabytes	123
Tape	26	units	26	32	units	32	32	units	32
Card R/P	4	units	3	6	units	4	6	units	4
Line Printer	6	units	12	8	units	17	9	units	19
Terminal	90	units	18	157	units	39	183	units	46
RJE	2	units	2	5	units	5	5	units	5
Graphics	1	unit	3	1	unit	3	1	unit	3
TOTAL BASIC MONTHLY RENTAL (K)			$265			$375			$416

PLANNING MILESTONES



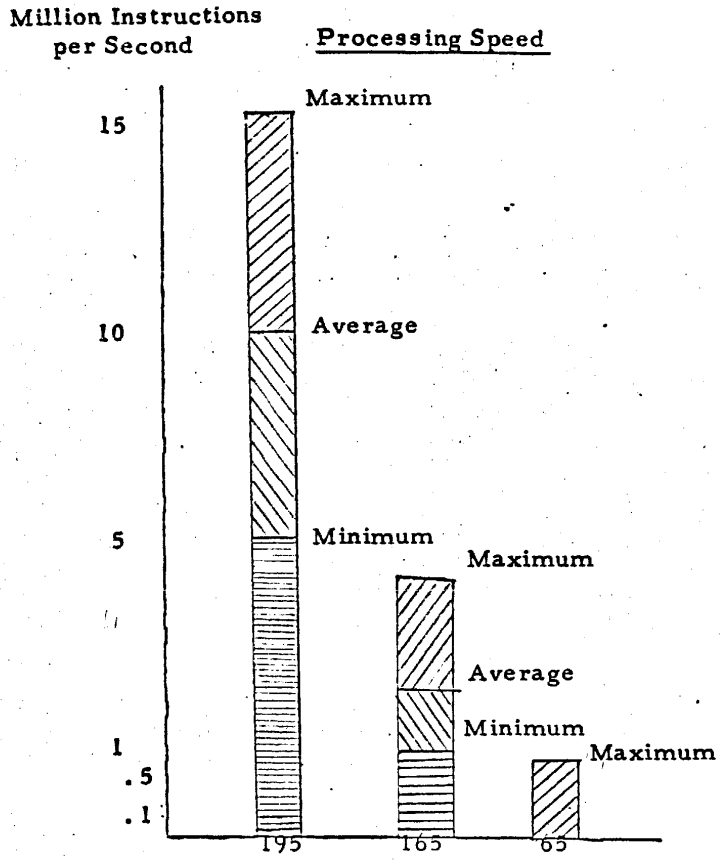
7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6

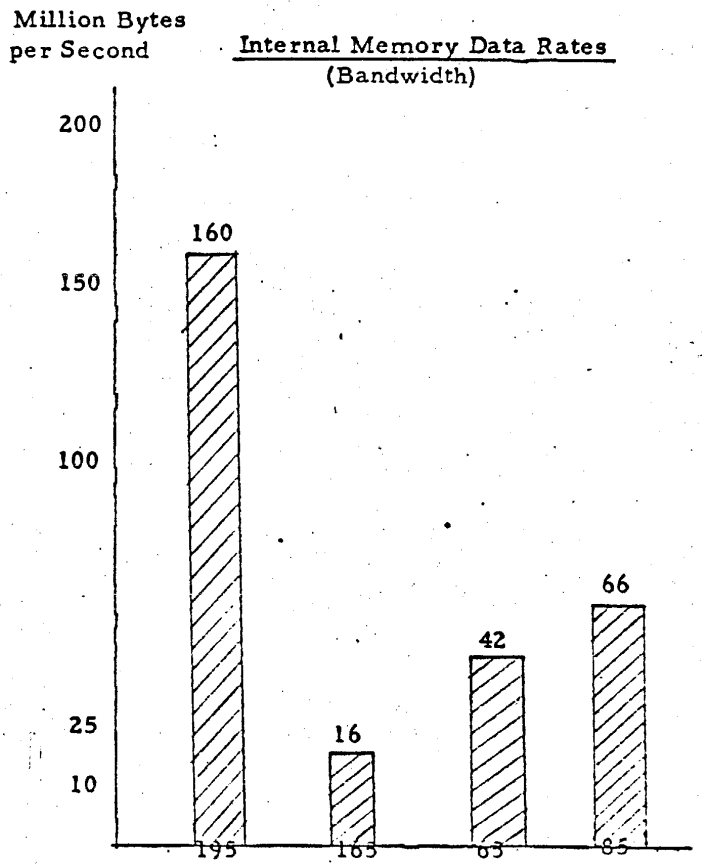
1971 1972 1973

COMPARISON OF CHARACTERISTICS

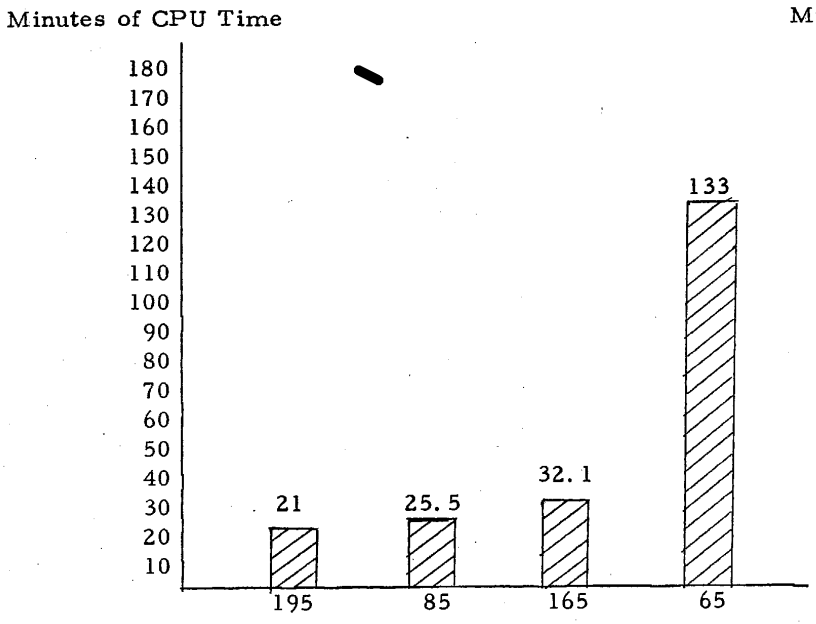
	360/65	370/165	360/85	360/195
Cycle Time (read/write)	200 NS	80 NS	80 NS	54 NS
Memory Cycle Time	750 NS	2,000 NS	960 NS	750 NS
Memory Capacity (standard)	1 mil.	3 mil.	4 mil.	4 mil.
Data Path	8 bytes	8 bytes	16/bytes	8 bytes
Interleaving	2 or 4 way	4 way	4 way	8 or 16 w
Channels:				
Selectors	5 or 6	5 or 6	5 or 6	5 or 6
MPX	1 or 2	1 or 2	1 or 2	1 or 2
Block MPX	Ø	6 or 7	12	6 or 7
Total maximum	7	12	13	14
No. of Concurrent Processors	1	1	1	3
Extended Floating Point	No	Yes	No	Yes
Buffer Size	None	32 K	32 K	32 K
Buffer Cycle Time	None	80 NS	80 NS	54 NS
Relative Speeds	1 X	3-4 1/2 X	3-7 X	3-19 X

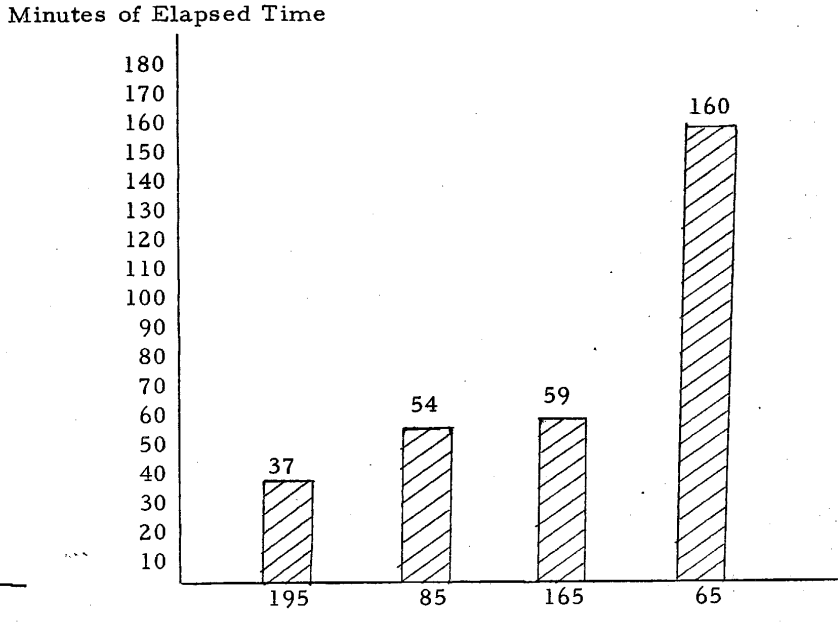
Performance Comparisons

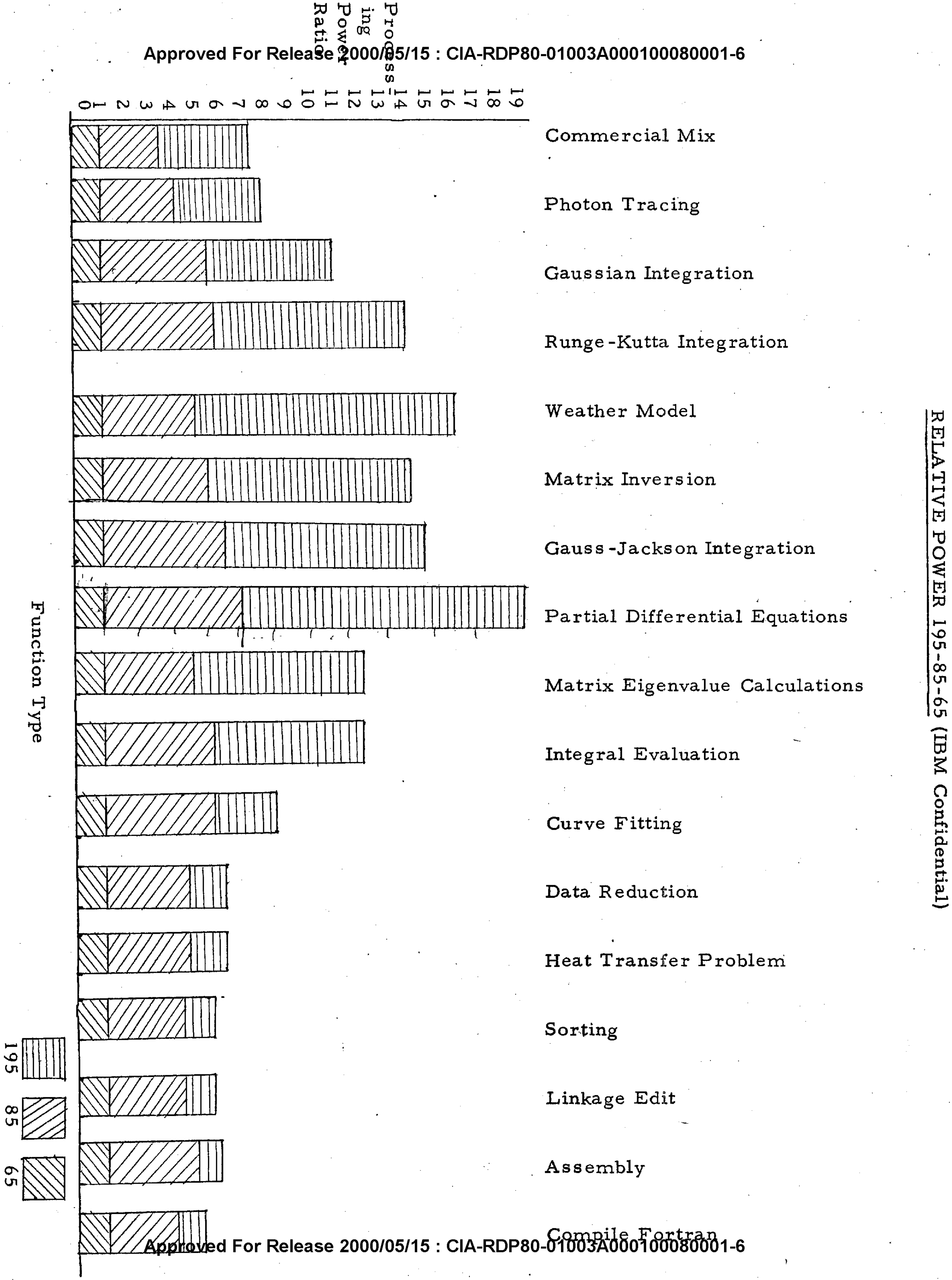


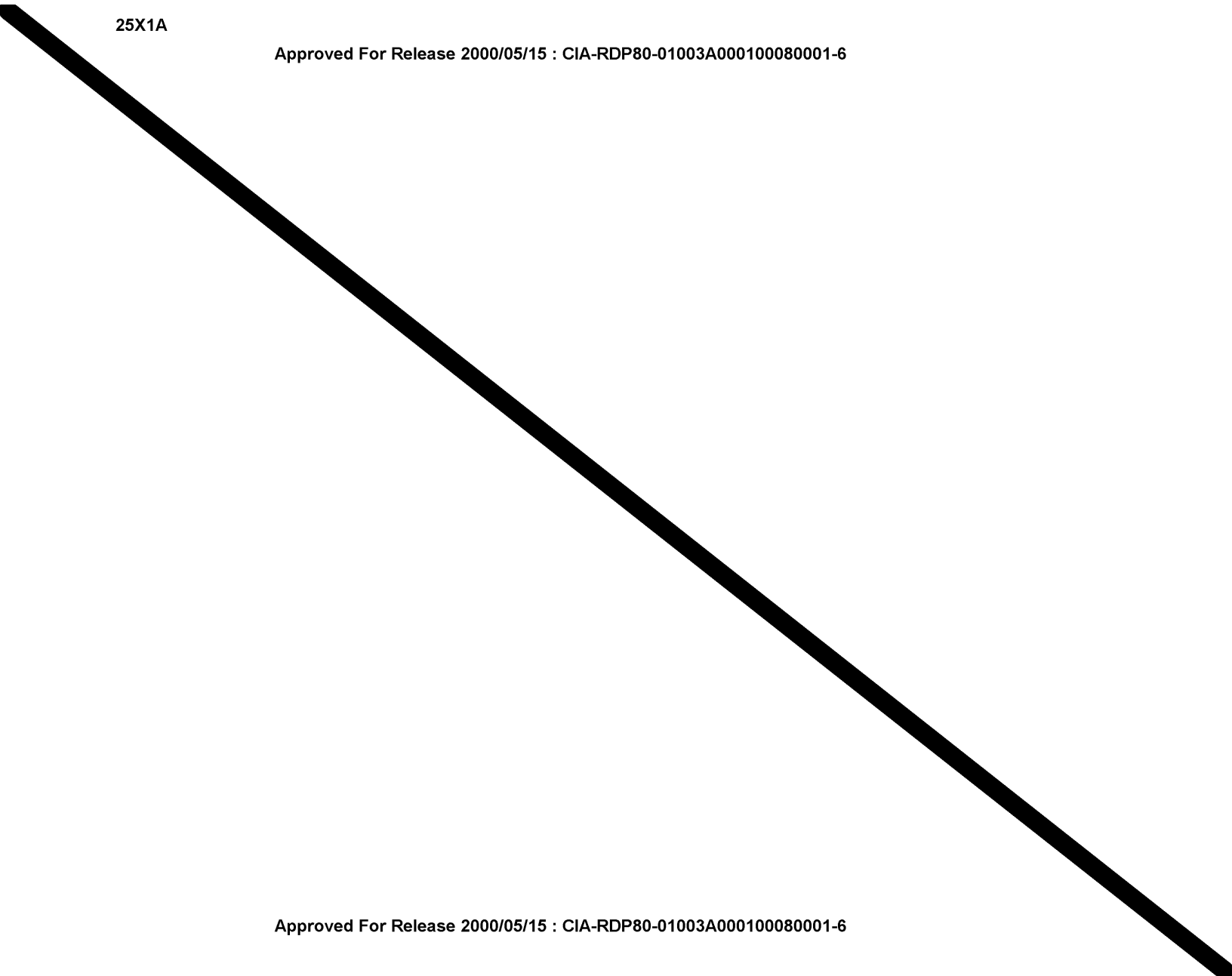


OCS BENCHMARK PERFORMANCE



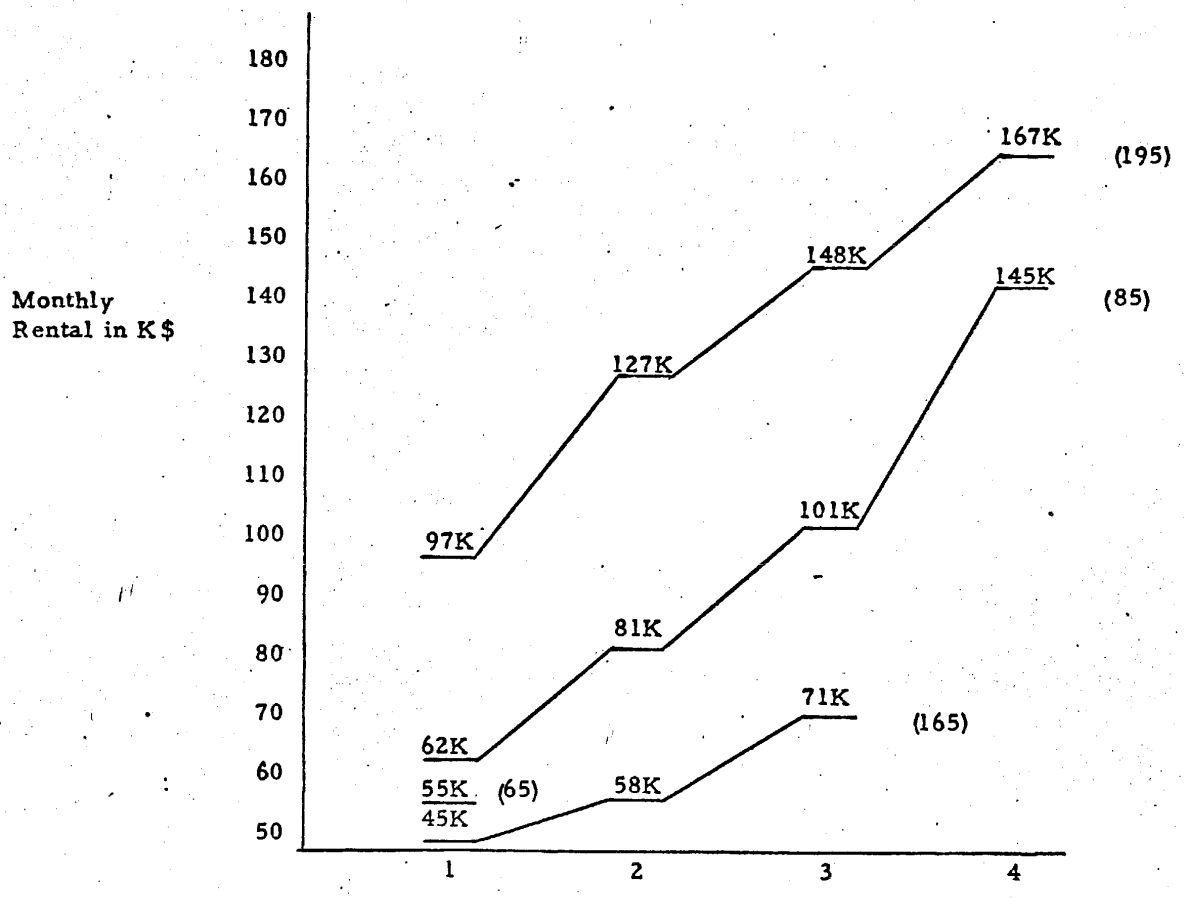






Approved For Release 2000/05/15 : CIA-RDP80-01003A000100080001-6

RELATIVE COSTS - 195/85/165/65 - CPU & MEMORY ONLY



Next 2 Page(s) In Document Exempt

CAUSES OF BUDGET INCREASE

- Projected increase in CPU power requirements
- Realistic configuration for the 195
- Larger core requirements
- SIPS on-line storage and terminals
- Networking

WHY 195 vs. 165?

- Bandwidth (160 vs. 16 megabytes)
- Cost performance (at least +1.5 to 1)
- Provides power to absorb:
  - -- Peak loads
  - -- Back-up to other centers
  - -- Software overhead
  - -- Increasing requirements
  - -- Security software overhead
- Least disruption for most gain
- Not limited in I/O handling specifications
- Can have larger core memory (4 vs. 3 megabytes)
- Construction and installation same as 165
- Establishes stability sooner

WHY 165 vs. 195?

- Less total expenditure
- Handles scientific job mix adequately
- Bandwidth adequate over short term
- Represents adequate CPU power increase over short term
- Allows flexibility in budget

(7)

80-01003a
Box 1 FOLDER 8
17 NOV 1972

PRODUCT OF OPERATIONS DIV.

OCS HARDWARE PLAN
1973 - 1974

I. INTRODUCTION.

During 1971 - 1972 the OCS hardware plan was to change to a reliable basic configuration which could grow to meet increased future requirements without major distrubance to the Agency workflow. The major thrust of this plan was the installation of an IBM 360/195 which is the most powerful computer produced by IBM and yet is downward compatible with all major systems presently installed. In addition to this hardware installation effort, there were two major complimentary systems software efforts: (1) the change from several separate and independent machines, each processing a share of the workload to an ASP system wherein the machines are loosely coupled into a single large system, and (2) the required conversion to the updated version (20.6) of the IBM Operating System in order to support the IBM 360/195. The installation of the Mod 195 and of the other system changes was coordinated through a documented four-stage plan, and this effort will be finished in December 1972.

This paper presents a general 1973 - 1974 plan for consolidating the past effort, enhancing several of the beneficial features of the present configuration to meet projected increased load, and integrating advanced and new hardware and software components such as "mass memory".

Even though this paper primarily addresses hardware, software and procedures are essential to the "hardware skeleton" for a total system and must be a part of the plan. Some general plans of software and procedures are included in the objectives.

II. OBJECTIVES

There are only two basic objectives:

- RELIABILITY to process Agency computing requirements, and
- Capability to MEASURE the system as to quantity and quality of product and as to cost effectiveness of its system configuration.

Measurement is a necessary tool to increase reliability, and these two objectives are a logically concurrent pair. The reliability objective on a large and complex system, such as that in OCS, can be rather elusive in that present measurements of the many dynamic variables are inadequate or imprecise, and quantifications tend to be disputed as to relevancy. Typically, either other computer centers use arbitrary measurements and "the customer gets what he gets", or the center solicits comments and opinions from the competing customers, whose differing subjective opinions reflect the service which each has received in the last month. OCS believes that a large computing center can be, and must be managed and evaluated by precise standards and measurements. Surveys of the managements of comparable installations (and also statements by computer consultants) indicate that no large and complex installations as yet have solved this problem; but all are striving for better reliability, and measurement is a necessary tool to attain it.

A. Reliability.

Reliability has two facets, that of stability which is the view of the computer operator and that of timely processing to meet turnaround and response requirements which is the view of the customer and which is a function of the first.

Specific target areas for improving reliability are:

1. Hardware change management.

In the last two years, OPS Division has successfully made many changes. Procedures are sound but sometimes have

been bypassed because of the pressure of rapid change requirements. The pace of changes will be much slower and existing procedures will be improved and tightened. The proposal for changes, the development, the testing, and the integration will be checkpointed and rigidly controlled.

2. Software change management.

We have developed an excellent system for controlling and documenting changes, but again because of the fast change pace, too often this system has been by-passed. Again, the pace will be much slower, and the major effort will be the management of software change certification rather than the integration of many new or advanced features.

3. Load leveling and multiple throughput paths.

The ASP system will automatically level loads, but at present our system has hardware configuration gaps which force nearly all jobs to one machine. The customer occasionally experiences unnecessary degraded service just because of the normal peaks and troughs of workflow. This system defect will be corrected.

4. Backup.

Our system has inadequate backup facilities for single processor failure for batch processing and for the interactive systems such as SIPS and other GIMS applications. This deficiency is corrected in the plan.

5. Reliable turnaround and response.

Customers repeatedly have requested a consistent predictable turnaround and response rather than a "good average" with highs and lows. This attainment of this objective is improbable during this time frame but measurements to understand the dynamic factors which

contribute are possible. Projection of future loading and hardware expansion to meet that loading is a must, especially if new loading carries a high priority which delays other processing. The present hardware has been configured so as to expand easily to meet future requirements. The capability for the timely transfer of data from magnetic storage to the processors is predicted to be a major future problem. OCS has plans for developing a mass storage capability and installing it on the system to alleviate this projected bottleneck to timely response and turnaround.

6. Acquire the most reliable hardware.

OPS continues to evaluate hardware from all manufacturers. Some hardware has proven to be more reliable and a better cost performer than that of IBM, the main frame supplier. Even though there are some risks and some problems with a multi-vendor shop, we believe we can manage the administrative and technical details to assemble the most reliable configuration.

7. Procedures.

We have good and documented procedures for normal processing. However, because of the fast pace of change, it has been impossible to document all contingencies for failures. Within the first 10 months of this plan, these procedures will be completed.

8. Training.

The quality of training for our operators relates closely to the quality of procedures. It is good for normal processing, but except for several individuals, it is an inadequate level for most. A training plan is being assembled.

9. Environment.

Our greatest risks to severe or long outages are from power, air conditioning, fire, and flooding. Up to now, OL has provided inadequate and non-professional support. In fact, the present defects in the computer environment are the Achilles heel of the computer support to the Agency. OCS will work with OL, or anyone else if necessary to remedy the existing situation.

B. Measurement.

Measurement is a necessary capability in order to establish norms of performance and to increase the efficiency in contrast to these norms. Too often we change the configuration because of some intuition (granted that it may be a very trained and experienced intuition) that we are optimizing, but rarely could these changes successfully be justified by logic supported by live data. Performance measurement and evaluation must be improved, and this effort will be a major undertaking of the next two years.

The customer's side of measurement is cost accounting so that he understands what computer processing resources are costing. OCS does now provide such accounting, but it can be improved. PACES, a commercial software package, is being installed to provide a better tool for improving not only the customer's accounting, but all performance measurement.

III. MAJOR BUDGET CHANGES FROM PREVIOUS ESTIMATES.

The present plan has several major budget changes from the budget as proposed two years ago. The changes reflect partially, performance and cost benefits of new hardware not available last year, and partially, system changes to alleviate future bottlenecks in the system. (See Chart I for a financial summary.)

A. Delay extra memory and other hardware enhancement installation on Mod 195 from December 1972 to December 1973. FY-73/74 savings = $526K.

The Mod 195 has 2M bytes, and projections had indicated that another 1M bytes would be necessary by December 1972. Such an increment indeed would improve the system but the Mod 195 has proven to be very powerful, and the increment is not needed at present and would not be cost effective.

B. Delay other hardware enhancements on Mod 195 beyond December 1973. FY-74 savings = $190K. Same rationale as A above. At this time not projected as a December 1973 requirement.

C. Delay IBM 370 procurement. An IBM 370/155 had been planned for installation at end of FY-73. FY-73/74 savings = $529K. IBM has not made the new 370 direct access storage devices compatible with the IBM/360 (except the 195). Now other manufacturers are installing compatible devices on IBM/360s. We plan to install such devices on our Mod 65s and 67s, thus in effect giving OCS nearly the equivalent of new IBM 370s. Since our two Mod 65s and one Mod 67 are purchased, their retention rather than leasing new equipment produces significant savings.

D. Replace IBM disks with CalComp disks. FY-73/74 savings = $439K. We have installed several CalComp disks and we prefer them to IBM disks. CalComp has given us extra discounts for volume and the savings are significant.

E. Purchase Delta Data terminals. Extra cost for FY-73/74 = $175K. Purchase charges for these terminals are equivalent to 23 months lease, and since we project at least five-year usage, it is economical to purchase.

F. Lease COMTEN rather than purchase. FY-73/74 savings = $130K. COMTEN equipment has not been as reliable and as cost

beneficial as projected. It is prudent to lease the second unit rather than irrevocably link us to this hardware.

G. Mass Storage. FY-73 costs = $750K. FY-74 costs = $1,000K. The timely transfer of data from magnetic files to the processors appears to be a major future bottleneck. This development project of the Advanced Projects Staff is intended to produce automatic access to magnetic files.

IV. SUMMARY OF MAJOR HARDWARE CHANGES.

A. Replace IBM 2260s with Delta Data terminals. (November 1972 - February 1974)

B. Increase memory on the 67-2 from .5M to 1.5M. (February - March 1973)

C. Increase memory on the 65-2 from .75M & 1M LCS to 2.25M (with no LCS). (June - July 1973)

D. Increase memory on the 65-1 from .25M and 1M LCS to 1.25M (with no LCS). (October - November 1973)

E. Installation of Mass Memory. (November 1973 - December 1974) Dates are not firm; projection is premature because it is not an on-shelf item.

F. Increase memory on 195 from 2M to 3M. (December 1973 - February 1974)

V. MAJOR HARDWARE TASKS (see attached chart).

A. Disk Units.

1. IBM 2314 direct-access storage facility. There are 17 installed, compatible IBM 2314 direct-access storage facilities, consisting of the following:

a. Eight IBM 2314 disk controllers

b. Five CalComp CD14/22 single-density controllers

c. Four CalComp CD1015/215 dual-density controllers

Seven of the eight IBM 2314 disk controllers are being replaced by CalComp CD14/22 single-density disk controllers, resulting in a saving of approximately $6,000 per month rental cost. The remaining IBM 2314 disk controller has a four-channel switching facility, not available from CalComp, which allows access from four systems.

Pending completion of an on-going study of disk use on the ASP/BATCH system, it is proposed to replace low usage disk units and controllers with CalComp CD1015/22 dual-density disk units and controllers, resulting in more effective utilization of floor space in the OCS Computer Center. (February - September 1973).

In order to restrict the number of disks to be mounted for batch jobs, the number of sharable disk units for user data sets on the ASP/BATCH systems will be increased from seven to sixteen. (April - September 1973)

2. IBM 3330 direct-access storage facilities.

   a. Disk units. A non-IBM 3330 disk controller and two disk units which are compatible to those of IBM will be installed on the S/360/67-2. An evaluation will be made of its use as a mass storage restorable device for the CP/CMS, and a determination made of the feasibility of replacing the ASP/BATCH system-resident disk units. IBM compatible 3330 direct-access storage facilities will be required on the CP/67 system and on the ASP system. (June 1973 - April 1972)

B. Tape Units.

Four additional IBM 3420 magnetic tape units have been ordered

for installation (January - March 1973) for the RCA Simulation and SIPS projects. This will result in the Computer Center's tape unit capacity consisting of eight IBM 3803 tape controls and 40 IBM 3420 tape units. OCS has made an evaluation of non-IBM tape units and even though several brands appear superior in performance with less cost, OCS has decided to delay a conversion. A reevaluation will be made during May 1973 - October 1973.

C. Terminal Controllers.

OCS has a combination of three Memorex 1270 terminal control units, two IBM 2702 transmission controls, and one COMTEN 3670 communications control module. The Memorex 1270 has shown the potential of being an adequate replacement for all IBM terminal controllers for IBM 2741 communication terminals, teletype terminals, and Delta Data 5200 display stations (replacing IBM 2260 displays).

A fourth and fifth Memorex 1270 will replace the two IBM 2702 transmission controls. The fourth Memorex will provide terminal support to the 67-2, and backup support for the SIPS and ASP terminal controllers. The fifth Memorex will provide additional capacity for terminals on the 67-1.

Pending an evaluation study of the COMTEN 3670, it is recommended that the order for the second COMTEN 3670 be deferred. The COMTEN 3670 is being evaluated for the following facilities:

1. Multiple system-access terminals
2. PEP 400 high-speed terminal
3. Remote printers
4. GIMS developmental terminals (connected to the S/360/-67s).

5. Backup support for ASP terminals, RJP lines, and SIPS terminals (acceptance of the COMTEN 3670 may allow it to replace the above mentioned fourth and fifth Memorex 1270s).

D. Terminals.

Occasionally, OPS is required to evaluate and install special terminals to meet a specific requirement. No such requirements are known, but will be handled per request. The major terminal task is the replacement of the IBM 2260s with the Delta Data 5200 series.

1. Replace 24 2260s and three 2848s on the Mod 67-1. (November 1972 - June 1973)
2. Replace 2260s and 2848s supporting applications under ASP. (February 1973 - July 1973)
3. Replace 2260s supporting ASP itself. (September 1973 - February 1974) It is not yet certain that the Delta Data terminal can replace these ASP 2260s without upgrading OS, and an IBM replacement may be desirable.

The Advanced Projects Staff is submitting its study and recommendations for graphic terminals separately.

E. User Terminal Cluster Areas.

Quiet, medium-speed remote printers and plotters will be evaluated by Operations' Technical Services Branch (December 1972 - April 1973) for installation at terminal areas (i.e., TSD, PSD, ORD, SAD, APS, and OPS/TSB). OPS has one REMCOM and three Data 100s as RJPs. The decision to replace the REMCOM has been made, but an on-going evaluation suggests that Data 100s may not be the best devices and possibly should be replaced.

F. Increase in Size of Mod 195 Memory.

This has been delayed to December 1973, which is a somewhat arbitrary date. This date will be reevaluated; but, in any case, the present computational load does not require more memory.

G. Increase in Memory Size of Mod 65s and 67-2.

The availability of fast memories from non-IBM vendors (and also the 370 IBM compatible disk drives) has given new life to these machines. Savings of space and money (one-fourth the price and one-fourth the space vs. those of IBM) are obvious. Former plans were to use non-IBM LCS but the new low costs and reduced space requirements dictate a change of plan.

H. Mass Storage.

The schedule for mass memory implementation is as follows:

1. Distribute RFPs to vendors. (January 1973)
2. RFP responses due. (March - April 1973)
3. Select RFP response. (May 1973)
4. Issue letter of intent; $750K required. (June 1973)
5. Install mass memory facilities on S/360/67-1 and/or S/360/67-2. (November 1974)

NOTE: An IBM 3330 direct-access storage facilitiy is required on system(s) where mass memory is installed.

6. Schedule mass memory production on S/360/67-1 and/or S/360/67-2; $750K required. (May 1974)
7. Install mass memory on ASP systems. (October 1975)

I. ANDI.

The system is scheduled for release. (July 1973)

J. New Systems.

A S/370/155 has been scheduled for installation in May-June 1973). Our purchased Mod 65s with non-IBM memories and disk drives are nearly equivalent and are adequate; thus, this previous plan has been canceled.

Either a S/370/168 will be ordered for installation and testing (May - June 1974), or a S/370 VM (Virtual Memory) and VS (Virtual Storage) replacement of S/360/67-2 and S/360/67-1 may be installed in January - February 1975.

K. Voice Response Unit.

The feasibility of a voice response unit for the ASP system has been investigated for over a year. Completed jobs have always waited for pickup for approximately one to two hours. As the turnaround time has decreased to less than an hour, we have the phenomenon in which this pickup wait time is greater than the actual processing time. A system which called the submitter upon job completion would reduce actual turnaround time service to the customer by another 50 percent. Other types of response, such as upon query also are being evaluated. Recommendations will come from the present study.

L. Terminal Patch Panel Facility.

An evaluation and recommendation of a replacement of the patch panel with an electronic switch mechanism is scheduled for June 1973.

M. Air Conditioning and Power Study.

A reevaluation of the present system will be made.

N. Unit Record Equipment.

1. IBM 3211 printers.

   Two 3211 printers will replace 1403 printers. (May 1973 and February 1974)

2. Paper Tape Reader.

   The present IBM 2671 paper-tape reader will be dedicated to the S/360/195 for the RCA simulation project, and one additional paper-tape reader will be ordered with required RPQs from any vendor, pending evaluation. Installation is planned for June 1973.

O. Computer Output Microfilm.

The requirements and support needed for computer-generated output for microfilm facilities will be evaluated during October - December 1973.

Attachments:

Chart I Operations Division Financial Summary to Support OCS Hardware Plan.

Chart II Major Hardware Tasks.

ACTIVITY	FY-73										FY-74												FY-75					
	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12
Stage IV completion	o	o	o	o	o																							
Replace IBM 2314	x	x	o	o	o																							
Study Graphics terminal	x	x	x	x	x																							
Replace patch panel	x	x	x	x	x	x	x	x	x	x																		
Voice response unit	x	x	x	x	x	x	x																					
Mass storage	x	x	x	x	x	x	x	x	x	x	x	x	x	x	o	o	o	o	o	o	o	o	o	o	o	o		
Study term ctl		x	x	x	x	x	x	x	x	x																		
Install compatible 3330		x	x	x	x	x	x	x	x	o	o	o	o	o	o	o	o	o	o	o								
Replace 2260s on 67s			o	o	o	o	o	o	o	o																		
Action on term ctl			o	o	o	o	o	o	o	o	o	o	o	o														
Medium-speed printer/plotter			x	x	x	o	o	o	o																			
Remote RJP and terminal areas				x	x	x	x			o	o	o	o															
Complete IBM 3420 (tot 40)					o	o	o																					
Release ANDI					x	x	x	x	x	x	o	o	o	o	o	o												
Upgrade 67-2 to 1.5M						o	o																					
Replace 2260s ASP (application)						o	o	o	o	o	o																	
Replace CAL single w dual						o	o	o	o	o	o	o	o															
AC and power study								x	x																			
Install shared packs 7 vs 16								o	o	o	o	o	o															
Replace 1403 printers									o	o								o	o									
Study and evaluate non-IBM tape drives									x	x	x	x	x	x	x	x												
Upgrade 65-2 to 2.25M (no LCS)										o	o																	
Add paper tape reader											o	o																
Upgrade 67-1												x	x	x	x													
Replace 2260s ASP (SYS)													o	o	o	o	o	o										
Upgrade 65-1 to 1.25M (no LCS)														o	o													
Microfilm study														x	x	x	x											
Upgrade 195 memory																o	o	o										
Install 168 (15X) for 67-2																						o	o	o	o	o	o	

Installation activity is indicated with the symbol 'o'.
Studies being conducted are indicated with the symbol 'x'.